U.S. Army Corps
of Engineers

Explore 12

The California Coastline
Point Fermin to Newport Beach

The Year of the Coast

The beauty and physical diversity represented by California's coast, bays, harbors and estuaries are exceptional. Uniquely spectacular scenery features mountains dropping steeply to rocky shores, rolling headlands and bluffs, fertile marshes, wide sandy beaches and dramatic vistas extending some 1,100 miles from Oregon to the Mexican border.

The sea acts as the coast's chief architect, and continual changes take place as waves, rains and winds reshape shoreline contours. Currents and tides continually refresh and nourish coastal lands and waters, where life forms are as diverse as their habitats. Here the mighty whale and the tiniest of organisms, salt marsh plants and towering redwoods, live together with man in an intricately balanced state of interdependence.

The coast means something different to each individual. Some cherish the fresh salt air, the sea breezes and the opportunities for contemplative solitude. Others enjoy the coast as a place to picnic and swim, to fish, sun or sail, while many choose to search for driftwood or study the mysteries of rocky pools. Many choose birdwatching in coastal bays, marshes and lagoons, while others value the potential for commercial and recreational development.

To the U.S. Army Corps of Engineers, California's bay and coastal areas mean a continuing dedication to management and preservation through effective coastal engineering, interdisciplinary investigations, exercise of regulatory authority, water quality and flood control activities, harbor development and protection, and fish and wildlife conservation.

To assist you in developing a greater knowledge and appreciation for California's coastline and its valuable resources, the Corps of Engineers has prepared a series of brochures which highlight both natural and man-made features. The sites included in each brochure were selected for their unique scenic significance, recreational opportunities and accessibility. Related information on various natural phenomena such as tidal action, beach formation and movement of currents has also been included, along with reference to numerous indigenous plants and animals. Such detail provides the visitor with an opportunity to gain an increased understanding of the many fascinating aspects of coastal areas.

Bring your camera and binoculars, your curiosity and sense of adventure and join us in exploring nature's wonderful gifts.

Point Fermin to Newport Beach

On an island in the middle of the bustling Los Angeles/Long Beach Harbor complex, between a busy roadway and a construction site, a California least tern wanders along the water's edge, oblivious to the special care being taken to assist the survival of its seriously endangered species. This 15-acre haven, a historical nesting site for perhaps six percent of the total California least tern population, is a creation of the Corps of Engineers and the Port of Los Angeles. The combined effort to help these once-prevalent birds, whose nesting and feeding areas have gradually been replaced by urban sprawl, is representative of a growing movement to preserve the natural environment that is the heritage of this now heavily developed coastline.

From Point Fermin's luxuriant tide pools to Corona del Mar's pristine beach, this stretch of California's south coast holds many wonders. At Cabrillo Beach, on a few magic nights just after the full moon, a multitude of silver-sided fish called grunion make a shimmering carpet on the sand as they wriggle ashore to spawn. Near charming Avalon, Santa Catalina Island's only town, buffalo roam free. And, immediately adjacent to the Coast Highway just south of busy Huntington Harbour, a primitively beautiful salt marsh teems with marine and terrestrial life. In many such special places, nature remains in glorious residence.

Travel here is usually blessed with mild, Mediterranean-like weather. The balmy climate is caused, in part, by the coast's abrupt turn to the east just south of Points Arguello and Conception. Cold water currents from the north, and the winds and fogs associated with them, are kept far off coast by the shift in alignment.

Among the early residents of this winterless land were the Shoshone Indians, who lived by hunting, fishing and food-gathering. They were followed by the Spanish, who established seven Franciscan missions in Southern California between 1769 and 1797. The picturesque and historic missions are not all that remains of this area's Hispanic history, however. In the softly melodious names of towns, streets, shops and restaurants, in the architecture of white-washed walls, red-tiled roofs and black ironwork, and in the gently paced lifestyle of the beach communities, the Spanish culture lives on. The Spaniards called this portion of the California coast *La Tierra Adorada,* the beloved land. As you travel here, we hope that you will enjoy exploring this diverse and intriguing area.


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Corona Del Mar Vista Point and Beach 9
Pacific Ocean
0 1 5 Miles

1 Point Fermin

To reach the dramatic, rocky headland known as Point Fermin, proceed south on the Harbor Freeway and exit at Gaffey Street.

A stop at Point Fermin overlook, located at the intersection of Gaffey and 34th Street, affords excellent views on a clear day of the colossal Los Angeles/Long Beach harbor complex. From the lookout point, continue south on Gaffey to reach Point Fermin Park, a 27-acre expanse of trees and lawns overlooking the Pacific. The park includes Point Fermin Lighthouse, built in 1874 of lumber and brick shipped around Cape Horn. This lighthouse guided mariners approaching the old ports of San Pedro and Wilmington that are now part of Los Angeles Harbor. Point Fermin Lighthouse was a working facility until World War II, when it was converted into a radar installation. Paths lead down from Point Fermin Park to the Point Fermin Marine Life Refuge, a rich kelp forest habitat populated by lobsters, black abalones, tube worms, sea hares, small octopi, and numerous fish species. Strict state laws protect the tide pools adjacent to these offshore kelp forest habitats.

The wind-blown peaks of Santa Catalina Island are often visible from Point Fermin Park. This 22-mile-long island, the most accessible and developed of the Channel chain, varies from one-half mile to eight miles in width. Like the rest of the Channel Islands, Santa Catalina is extremely rocky. The land rises to more than 1,000 feet, then sharply drops off to water thousands of feet deep.

Until 1821, when Mexico was freed from Spain and the Spanish ban on foreign trade in California was lifted, Santa Catalina served as a base for smuggling operations.During the Civil War, the island served as a hide-out for Confederate sympathizers.

Until 1919, when Santa Catalina was bought for $3 million by chewing gum magnate William Wrigley, Jr., various owners attempted to develop the island. It was Wrigley who made Santa Catalina a commercial success by creating the romantic, palm-studded bayside town of Avalon. Today, a nonprofit foundation, the Santa Catalina Island conservancy, owns 86 percent of Santa Catalina and is in charge of preserving the island's rich natural environment. Tours to the island leave from terminals in Long Beach and San Pedro, as well as from Newport Harbor's Balboa Pavilion.

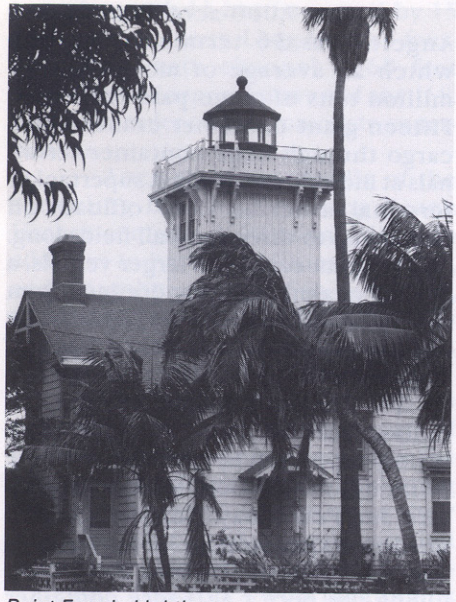
Kelp Beds

Santa Catalina Island's reputation as a spectacular diving locale rests largely on the eerie beauty of the forest-like beds of giant kelp surrounding the island.

Giant kelp, or *Macrocystis pyrifera,* is found along the island's rocky coast in depths to 100 feet. The huge plants filter the sunlight into a semi-darkness of somber beauty. They provide an underwater habitat for more than 750 varieties of fish and invertebrates.

A giant kelp plant has a root-like *holdfast* that anchors it to a hard surface on the ocean floor. Leading up from the holdfast to the water's surface are the plant's tough *stipes,* or stems. Along the stipes grow flat, golden-brown *fronds* buoyed by small, gas-filled *spheres.* The portion of the plant floating on the surface of the water is known as the *canopy.*

The undersea forest created by a giant kelp bed supports a greater amount of life than a comparable forest on land. For example, one giant kelp may feed 500,000 tiny animals. Many marine creatures, including kelp crabs, squid and shrimp use the kelp forest as a nursery for their young. Some fish, such as the anchovy and several varieties of perch, use the shelter of the plants as a protective haven. Others, including bonito, kelp bass, sheephead and Pacific barracuda, as well as sea lions, cruise the kelp beds in search of prey.



Point Fermin Lighthouse

2 Cabrillo Beach and Museum

To reach Cabrillo Beach and Marine Museum from Point Fermin, return on Gaffey to 35th Street. Turn right at Stephen M. White Drive and follow the road to its end.

The Cabrillo Museum offers richly stocked marine aquariums, as well as numerous ship models and historical exhibits. The museum is also headquarters for a variety of activities, including excursions to watch the winter migration of the gray whales and guided tours of tide pools along the base of the Point Fermin cliffs.

Crescent-shaped Cabrillo Beach, named for Portuguese explorer Juan Rodriguez Cabrillo, is a man-made beach. It is the only sandy beach for several miles in either direction along this erosion-prone shoreline. The beach was created in a two-stage project completed in 1963. Initially, a 755-foot rubblemound groin was constructed perpendicular to the San Pedro Breakwater at the east end of the present beach. This structure retards the movement of sand by the longshore current. Following the construction of the groin, 1.2 million cubic yards of sediment dredged from Los Angeles Harbor was deposited on shore. Since completion of the project, the longshore current has been retarded and Cabrillo has become a stable beach, with sand gain equalling sand loss.

Adjacent to the sandstone and granite San Pedro Breakwater is the Cabrillo fishing pier. Common catches include perch, sandab and leopard shark. Across the cove, abandoned World War II gun emplacements protrude from the edge of the steep bluffs.

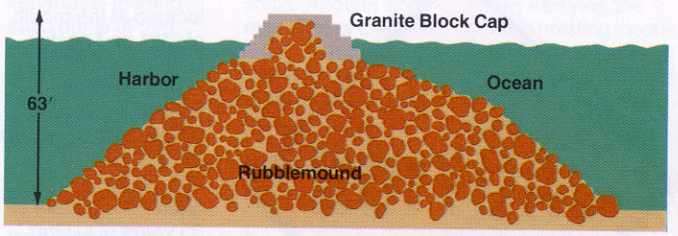
Rubblemound groin built at Cabrillo Beach in 1963

Beginning of two-mile-long San Pedro Breakwater, capped with quarried rock

San Pedro Breakwater

The San Pedro Breakwater, extending more than two miles into San Pedro Bay from Cabrillo Beach, provides calm water for Outer Los Angeles Harbor. Two detatched breakwaters, totalling approximately six miles in length, protect the Inner Harbor area.

Construction of the San Pedro Breakwater, begun in 1899 with Federal and State funds, was completed in 1910. The massive structure was the vital beginning for what was eventually to become the Los Angeles/ Long Beach Harbor complex. The 18,500-foot Middle Breakwater and the 13,350-foot Long Beach Breakwater, which assist in protecting the harbor complex, were completed in 1937 and 1949, respectively.



San Pedro Breakwater as seen from Point Fermin overlook

3 Ports of Los Angeles and Long Beach

The twin ports of Los Angeles and Long Beach, bounded on the north by the steep cliffs of Point Fermin and on the south by the mouth of the Los Angeles River, comprise 50 miles of harbor frontage along the various channels within San Pedro Bay. The ports comprise the world's largest man-made harbor complex.

When discovered by Juan Rodriguez Cabrillo in 1542, the harbor area of San Pedro Bay was a giant marshland. Today, the Los Angeles/Long Beach Harbor complex includes two outer harbors with protected anchorage areas, two inner harbors connected by a navigable waterway and an extensive system of turning basins and connecting channels. Most ocean-going vessels are accommodated here.

The 7,000-acre Port of Los Angeles has 36 terminals through which an average of more than 40 million tons of cargo pass each year. Fifteen giant container cranes move cargo through huge container terminals at incredible speeds. A supertanker terminal at Berths 45-47 offloads oil tankers up to three football fields long. To accommodate even larger vessels, a special channel is being dredged from the harbor entrance to the supertanker facility by the U.S. Army Corps of Engineers.

The development of the $270 million Port of Long Beach has been mainly supported by revenues from the Wilmington Oil Field which extends into San Pedro Bay. Currently, a $60 million expansion of Long Beach's container facilities is being completed, giving the port a 320-acre container

Caution

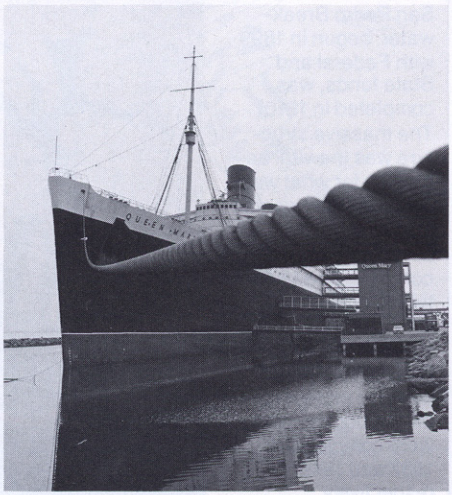
In spite of the wondrous beauty and typically non-threatening appearance of the California Coast, exploration of cliffs, rocks and tide pools can be dangerous.

Remember to stay well back from cliff edges where softened soils, particularly during rainy periods, often slide easily. Rocks moistened by rain or surf can be slippery. Powerful, unexpected waves can quickly throw one off balance. Always watch for incoming tides and wear non-slip, protective footgear for rock climbing and tide pool exploration. Be aware of the dangers of wave backwash and rip currents.

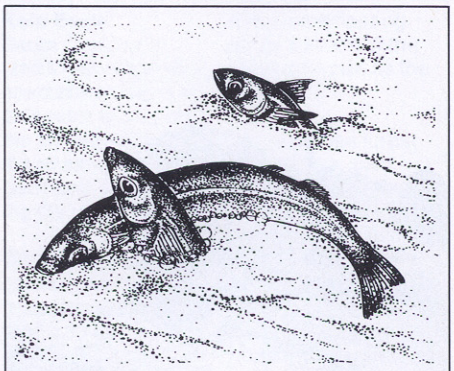
The Queen Mary

The Queen Mary is located at the mouth of the Los Angeles River. The City of Long Beach purchased the 81,000 ton British luxury liner in 1967 for $3.45 million. Today, after a glamorous history of 33 years of sailing, the stately ship is an enormous maritime museum and a popular tourist attraction.

During World War II, the Queen Mary transported more than 800,000 Allied troops through submarine infested seas at incredible speeds of more than 30 knots. The ship's facilities now include a luxurious 400-room hotel, numerous shops and restaurants, and a huge undersea aquarium designed by Jacques Cousteau.



Queen Mary



Grunion

Cabrillo Beach is a favorite spawning ground of the grunion, a small, silver-sided fish that wriggles ashore to mate at a few favored spots along the Southern California coast. Grunion regularly arrive on the second, third and fourth nights following the full moon, just about 15 minutes after each of the two highest tides of the month, from March through September.

On most spawning nights, the Cabrillo Museum staff shows an informational film about grunion and takes groups out to the sand to witness the run. Swept ashore by high waves, female grunion bury their tails in the sand to deposit their salmon-colored eggs, which are then fertilized by the males. The eggs remain hidden in the sand until the next high tide when the sea washes the hatchlings out to deep water, where they grow to maturity.

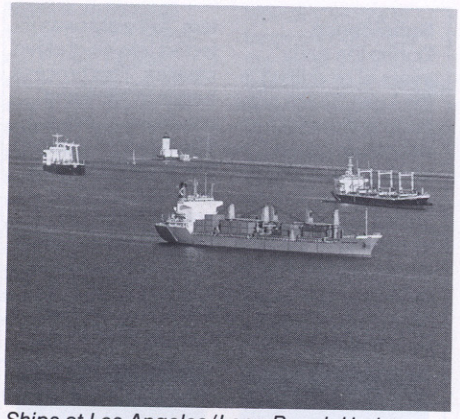
complex with 13 berths served by 15 high-speed cranes. Long Beach's four-mile-long main channel is 60 feet deep—the deepest fairway of any U.S. port—in order to accommodate supertankers.

Located in the middle of the sprawling Los Angeles/Long Beach Harbor complex is Terminal Island. In addition to harbor facilities, oil wells, and a number of large fish canneries, the island houses a medium-security Federal prison, a naval base and a U.S. Immigration and Naturalization station.

The twin ports of Los Angeles and Long Beach are bustling centers of technological progress. Yet within the area, many wild creatures, including several endangered species, raise their young in protected reserves nestled amidst the clamorous, industrial environment. The port's wild inhabitants include 83 species of birds, among them the endangered brown pelican, Belding's savannah sparrow and the least tern. More than 100 fish species thrive in harbor waters, including the white croaker, the queen fish and the northern anchovy.

To observe the harbor area, return from Cabrillo Beach via 36th Street to Gaffey Street. Follow Gaffey north for approximately three miles, turn right on Highway 47 and cross the 6,000-foot-long Vincent Thomas Bridge to Terminal Island. Beyond the bridge's toll plaza, much of the area to the right of the roadway is occupied by the Long Beach Naval Station. To the left are commercial shipping facilities.

Continuing south across Terminal Island, turn right onto the Long Beach Freeway to reach the Queen's Highway, which leads to the Queen Mary. This historic and glamorous luxury liner, now open to the public, was once considered the monarch of the Atlantic. Returning from the ship, turn right onto the Queen's Way Bridge and continue south along San Pedro Bay. The bridge crosses the Los Angeles River which is channelled for flood control purposes. Before major floods in 1938, the river discharged into an estuary in Wilmington. Following the floods, the present outlet was excavated to confine the river and speed the water's flow to the ocean during torrential rains.



Ships at Los Angeles/Long Beach Harbor complex

Vista of harbor from Point Fermin overlook

Container Cranes

It is interesting to watch container cranes in action at the Ports of Los Angeles and Long Beach. These immense pieces of mechanical wizardry are major contributors to the technological revolution that has swept the shipping industry. Containerization allows manufacturers to simply load goods into standardized aluminum containers provided by shipping companies instead of separately loading each piece of merchandise. At the dock, giant cranes lift the containers, some of which are as big as railroad cars, and lower them into the containership's hull.

The standard container crane is an A-frame structure, as much as 23 stories high, with a bridge-like boom that moves up and down to accommodate the masts or stacks of ships. Another common type of crane is lower than the A-frame and rectangular in shape, with a boom that slides forward and backward in reaching movements.

The two types of cranes operate similarly. During a loading operation, for example, a truck or a freight car loaded with containers is moved into position near the crane. A trolley carrying the crane's hoisting mechanism then moves out above the stacked containers, lifts one, then moves back above the ship and lowers the container into the hull. Some container cranes can perform this entire operation in less than a minute, reducing the total loading and offloading of a ship to a matter of hours.

Containers being moved to waiting trucks

Container cranes at work

4 Bixby Park and Long Beach Shoreline

After crossing the Queen's Way Bridge, exit at Shoreline Drive, then turn right at Ocean Boulevard and follow the Long Beach shoreline to Bixby Park.

Offshore are four clusters of what appear to be high-rise buildings. The structures are, in fact, oil drilling islands with derricks designed to be esthetically compatible with development along the Long Beach shoreline.

A portion of the sediment supply for Long Beach's seven-mile stretch of white sand beach comes from the mountains and is carried to the ocean by the Los Angeles River during heavy rains. Since the damming and channelling of the river, however, this sediment supply has been severely curtailed and the beaches are periodically replenished with sand dredged from the harbor area. Most of the beach is open to public use. Parking areas are located at the foot of Cherry Avenue, at the nearby Belmont Fishing Pier, and at several locations down the coast.

Lovely, 10-acre Bixby Park is located at the intersection of Cherry Avenue and Ocean Boulevard. Visitors will enjoy the park's wide, rolling lawns shaded by oak, pine, cypress and palms. The park affords excellent views of the half-mile-long Belmont Pier, the Queen Mary, the oil derrick islands, and the Long Beach and Middle Breakwaters.

To return to the Coast Highway, follow Ocean Boulevard south to Livingston Drive. Turn left on Livingston and right on Second Street, then follow Second across Alamitos Bay to Naples Island. Turn left from Second Street onto Ravenna Drive to reach Marine Park, which has playgrounds, a salt water swimming pool, an artificial lagoon and the Marine Stadium built for the 1932 Olympics. Follow Ravenna to its end, then turn left onto the bridge that connects Naples with the mainland.

Continue south and turn right onto the Coast Highway. Within a mile, the highway crosses the Orange County line and the San Gabriel River. Like the Los Angeles River, the San Gabriel has been dammed and channelled for flood control purposes. Waters discharged from power generating plants along the river provide a warm water habitat enjoyed by numerous marine species including the stingray.

Adjacent to the Orange County line is the town of Seal Beach. It served as a port for Anaheim's wine growers until the 1880's when a vine

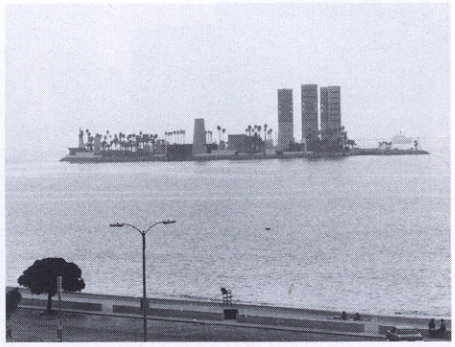
Long Beach shoreline during the 1920s

Typical oil well as seen along Pacific Coast Highway

Oil Islands

The design, construction and operation of the four oil islands located off the Long Beach shoreline is a joint venture of the City of Long Beach and several oil companies. Built in the 1960's, each 10-acre island has a rock perimeter containing approximately 160,000 tons of granite barged from Santa Catalina Island. The interior core of each island consists of 900,000 yards of hydraulically placed sand fill. Pipelines transport the pumped oil from the islands to the mainland.

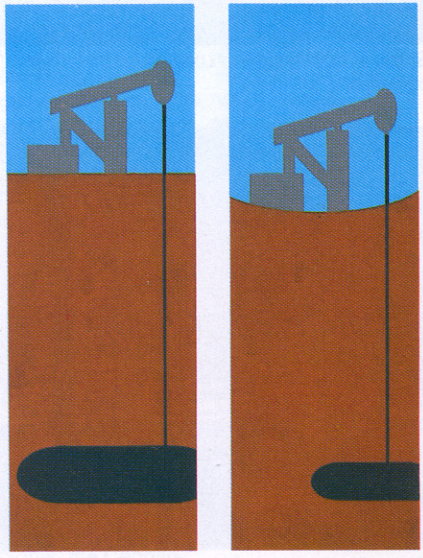
The cost to build each island, exclusive of the oil facilities, was $2 million. Beautification expenses, including planting trees and shrubs and camouflaging and soundproofing the 178-foot oil derricks, averaged another $1 million. When the oil supply beneath the islands is depleted, plans call for the islands to be converted into recreational areas.



One of four oil islands off Long Beach shoreline

Subsidence

During the early years of oil drilling in the Long Beach area, large withdrawals of petroleum caused the water table under the city to lower. This resulted in subsidence, or settling of the land. Areas of Long Beach suffered considerable structural damage. To remedy the problem, salt water was injected into oil-drained cavities. This process began in 1959 and continues to this day. The injection stopped the settling but created a new difficulty — contamination of Long Beach's ground water supply by the salt water. No solution to this problem has yet been found.



disease eliminated viticulture in the area. At nearby Los Alamitos U.S. Naval Weapons Station is the Seal Beach National Wildlife Refuge, a 1,100-acre wetland habitat.

Bolsa Chica Ecological Preserve

5 Anaheim, Sunset and Bolsa Bays

Anaheim Bay is shielded from wave attack by a mile-long beach. Two jetties stabilize the entrance at the northwest end at Anaheim Bay Harbor. This entrance provides the only access to the sea for the interconnecting system of waterways, marshes and tidal flats that comprise Anaheim, Sunset and Bolsa Bays.

Most of Sunset Bay has been dredged and filled to develop the residential marina and boating complex of Huntington Harbour. East of the harbor, the beach communities of Surfside and Sunset Beach form a continuous strip. Prior to 1944, when the Navy built two jetties to enlarge outer Anaheim Harbor, the south-flowing longshore current transported sediment to the beaches of Surfside and Sunset Beach. Once completed, the jetties began to trap the sediment flowing along the shore. In addition, the east jetty reflected waves directly toward the Surfside/Sunset Beach shoreline. The combined effect of reduced sediment supply and increase in wave energy beating against the coast aggravated local beach erosion. Since 1964, this problem has been remedied by periodic nourishment of the shoreline by the U.S. Army Corps of Engineers. The millions of cubic yards of sand needed to replenish the area have been obtained from the entrance to Anaheim Bay and another site several miles offshore.

Bolsa Bay, the most southerly of the area's three interconnected bays, was once an extensive salt marsh before its development by the oil industry during the 1920's. In the

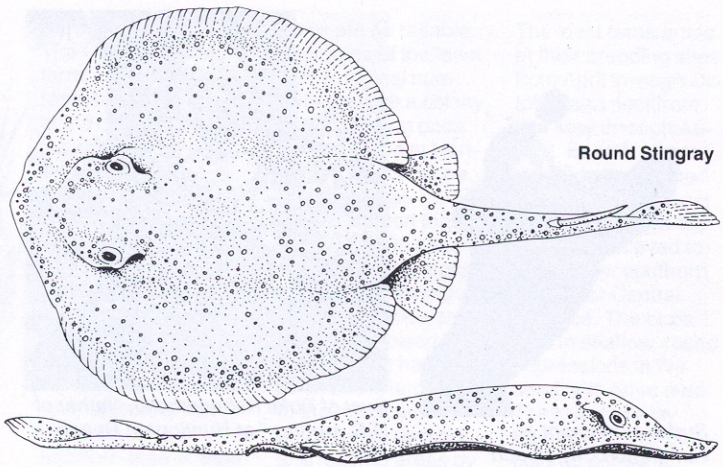
Marine Nurseries

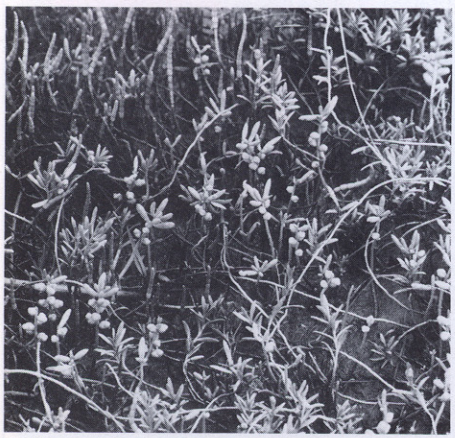
Bolsa Chica Ecological Preserve and other nearshore marshy areas are ecologically and commercially important since they serve as vital nurseries for numerous fish species. Among them are the northern anchovy, the surf smelt and the round stingray.

The northern anchovy, which grows to a length of approximately eight inches, typically swims in large schools near the water's surface. Its deeply cleft mouth extends well behind its eyes. Its abdomen and sides are covered with large, silvery scales and it has a forked tail.

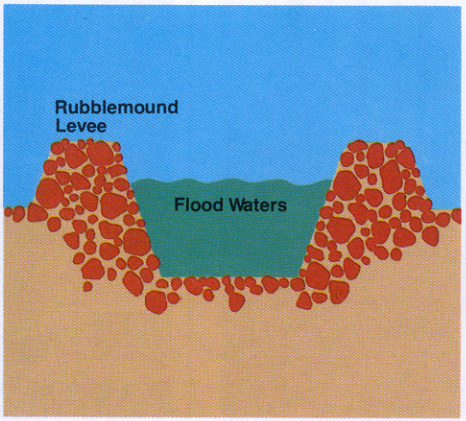
The slender surf smelt, can grow to a length of 10 inches, and has silvery, purple-hued sides, a light green back, and a small fleshy fin.

Flat and nearly circular in shape, the round stingray can be recognized by its brownish surface and yellow underside. It sometimes grows to a width of nearly 20 inches. The upper portion of the ray's tail is armed with a saw-toothed spine. This venom-covered sting is used in a whiplike fashion when the stinging reflex is provoked, for example, by predators.





Salt marsh vegetation at Bolsa Bay



Channelized Rivers

In recent years, Southern California's major rivers and their tributary streams have been channelized. This has been done to prevent the devastating floods which periodically inundate low-lying areas, causing millions of dollars in property damage and sweeping vast quantities of irreplaceable soil out to sea.

The channels that now confine some of Southern California's major rivers and streams carry water to the ocean more rapidly than natural stream and river beds. The channels' flood control capabilities are supplemented by inland debris basins and dams.

southern reaches of Bolsa Bay, where the Coast Highway crosses the Anaheim Bay Bridge, numerous large, round floats bob in the water. These floats were used during World War II to hold up huge nets designed to thwart any enemy submarines attempting to enter the bay. Today the floats are used to keep boats from entering protected marsh areas.

Several hundred acres of Bolsa Bay have now been set aside for the Bolsa Bay Ecological Reserve. The reserve begins near the southern end of Huntington Harbour at the intersection of the Coast Highway and Warner Avenue. The reserve is closed to the public, but a wooden walkway located directly across the highway from the entrance to Bolsa Chica State Beach provides an excellent observation point. The Department of Fish and Game has implemented a restoration project to flood this area and return it to a productive salt marsh habitat. During high tides, tidal gates to the north of the walkway are closed and the water is trapped, enlarging the marsh area.

Lush wetlands bordering Anaheim Bay

6 Huntington Beach and Santa Ana River Mouth

Huntington Beach became a boom town when oil was discovered in 1923. The city's oil fields continue to be highly productive as a result of both onshore and offshore drilling. Numerous oil pumps can be seen along the left side of the Coast Highway as you proceed south. Some of the pumps pull oil from offshore drilling facilities through pipes that run under the roadway and along the ocean floor. This process is known as the whipstock drilling method.

Although the Huntington Beach area is perhaps best known for its oil reserves, the city is also famous for its surfing beaches. At times, myriad surfers can be seen in the waves on either side of the long fishing pier that extends out from the city's Main Street.

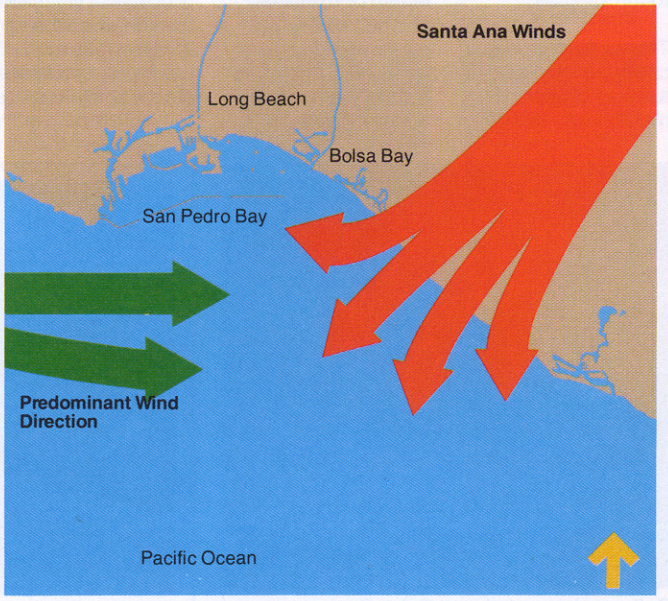
Surfer monument at Huntington City Beach

Bust of Duke Kahanamoku, "father of U.S. surfing," at Huntington Beach Pier

Popular Huntington Beach Pier

Santa Ana Winds

The Santa Ana winds are hot, dry winds blowing down the valleys of Southern California. Normally, winds blow onshore—from the ocean across the land—but the Santa Anas blow in the reverse direction. For anywhere from several days to a few weeks in fall or winter, the winds blow from the Mojave Desert across southern California and out over the ocean, often bringing temperatures near 100 degrees. The Santa Anas, which can reach hurricane strength, knock down and smooth out waves along the beaches, and create unusually large waves offshore. Such waves typically cause damage to shoreline and anchorages in the normally protected harbors of the offshore islands.



This beach changes dramatically with the seasons. Summer's gentle waves lift sand grains from the underwater beach face and nudge them shoreward, piling them into a low terrace called a berm. In winter, large, steep storm waves erode the berm, pulling the sand out to deeper water where it forms offshore bars. When winter passes, the bars slowly migrate toward the shore with spring's gentler waves to form a wide summer beach.

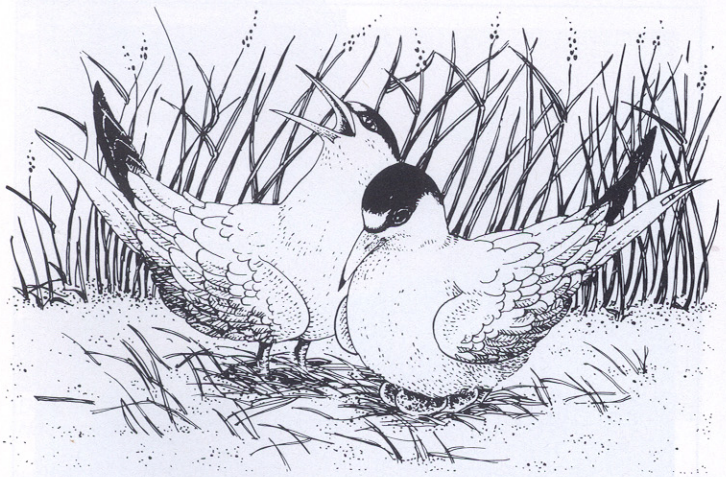
To the south of the municipal beach is Huntington Beach State Park, a two-mile-long expanse of sand. Numerous shorebirds can often be seen running along the surf's edge, busily feeding on insects, tiny crustaceans, and worms. Flocks of small white sanderlings are frequently sighted here and are a delight to behold as they move rhythmically back and forth like a miniature *corps de ballet* in response to the ebb and flow of waves.

The mouth of the Santa Ana River is just south of Huntington Beach State Park. A parking lot to the right of the Coast Highway, just before the Santa Ana River Bridge, provides a good vantage point for viewing the river mouth and a protected breeding area for the endangered least tern.

Adjacent to the parking lot at the river's mouth, grasses have been planted in an attempt to stabilize the small dunes in which the terns build their nests. Bamboo plants serve as another shoreline stabilization aid. These plants were carried down the river during floods, and gained a foothold here at the river's entrance to the sea.

During the torrential rains of 1938, the now-channelized Santa Ana River flooded an area three miles wide. The huge amounts of sediment washed to the coast formed a delta at the river mouth. During winter storms, silt and sand are deposited in this delta by high river flows. During these flows, small silt and clay particles are carried offshore. Larger sand particles remain near shore and are available for longshore transport to nourish adjacent beaches.

Shore birds on area beach



California Least Tern

The California least terns seen in the protected nesting area at the mouth of the Santa Ana River are among the endangered survivors of what was once a teeming population.

Historically, the breeding range of this elegant white and gray subspecies of the least, or "little," tern, extended from Monterey to the southern area of Baja California. Although there are no reliable estimates of the least tern's original numbers, in 1909 a colony of 600 nesting pairs was reported at Huntington Beach alone. As recently as 1975, it was estimated there were only 600 nesting pairs surviving along the entire coast including a small population in San Francisco Bay. This decline has been due in large part to the replacement of the birds' nesting and feeding areas by urban development.

The least terns arrive at their breeding sites from April through October and nest from late May through August. Exactly where the birds spend the rest of the year is not known, although the sites are believed to be in either southern Mexico or Central America. The birds nest in shallow, round depressions in the sand or in dried mud. They typically lay from one to four buff-colored eggs that hatch within 25 days.

Mouth of Santa Ana River

Southern California surfers

Sunbathers on Huntington City Beach

7 Dory Fleet and McFadden Wharf

To reach Newport Beach Peninsula from the north, turn off the Coast Highway at the Balboa Boulevard exit.

Newport Beach was the first town established on Newport Bay. It was a sleepy little village until 1899 when a wharf was built. The wharf transformed the community into a busy shipping and distribution center for Orange, San Bernardino and Riverside counties. Newport Beach's growth was also assisted by resort development that began in the 1890's and by merger with the adjacent town of Balboa in 1902. Today, along with Costa Mesa and Corona del Mar, the Newport area forms one of the most popular water recreation areas in Southern California.

The dory fishing settlement adjacent to the Newport Pier is an interesting site. To reach the pier, which is built on the site of the original McFadden Wharf around which the town developed, turn right from Balboa Boulevard on McFadden Place and follow the street to its end. Here the dory fishing fleet was founded in 1891 and is the last of its kind in the country. Fishermen launch their small flat-bottomed boats at dawn and return several hours later to sell their catches on the beach. Among the usual offerings are red snapper, perch, rock cod and bass.

Upcoast from Newport Pier is a series of rubblemound groins. These structures stabilize the beach along this erosion-prone shoreline by trapping sand being moved along the coast by the longshore currents.

8 Newport Harbor

Newport Harbor occupies the lower portion of Newport Bay. The Bay was created by the southeasterly growth of the Newport sandspit across the mouth of an ancient river and estuary. Balboa and Lido islands were built-up with dredged sediments on shoals within the estuary.

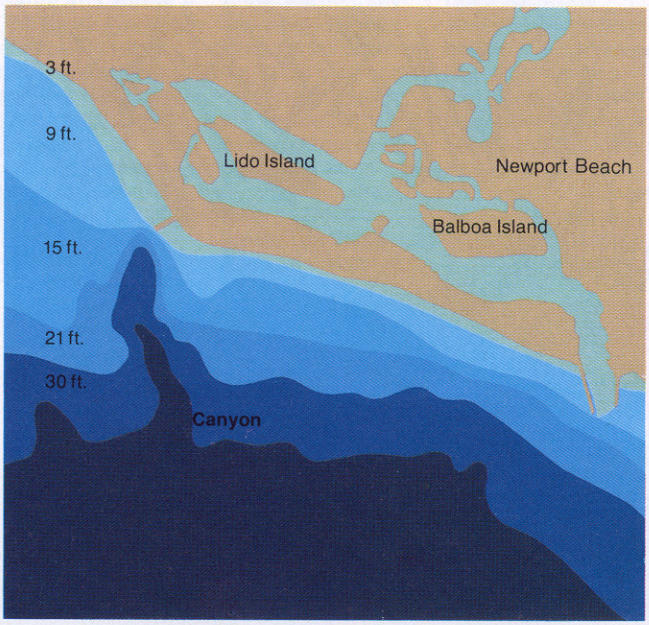
The development of Newport Bay Harbor from a shallow, natural harbor was authorized by the Federal government in 1934. The work, carried out by the U.S. Army Corps of Engineers, included the construction of entrance, main and inner channels, a turning basin, anchorage areas and two entrance jetties. This harbor was one of the first built in California for the exclusive use of small boats. Newport is now one of the great yachting centers of the United States.

Groin Field
Between 1968 and 1973 the Newport Beach groin field was built by the U.S. Army Corps of Engineers as part of a long-term, 17-mile beach restoration and shoreline protection project. The project extends from Surfside-Sunset beaches through Newport.

The eight groins, which extend under the sand almost from the doors of shoreline homes and out several hundred feet into the ocean, retain sand on the beach. Prior to construction of the groin field, Newport experienced severe beach erosion as a result of heavy wave action and reduced sand supply from local rivers that had traditionally fed the beach.

As the groin field was being completed, the Corps filled the spaces between the structures with beach sand rather than trapping the natural longshore movement. This permits the natural movement of sand to continue, precluding erosion of downcoast beaches.

Aerial view of Newport Beach groin field



Newport Submarine Canyon
The Newport Submarine Canyon, one of three such canyons located offcoast from Los Angeles and Orange counties, comes near shore just off the Newport Pier. Formed by the Santa Ana River during periods of lower sea level, the canyon's most noticeable effect is a deflecting action exerted on waves approaching the Balboa-Newport area. The results are gentle waves and a stable shoreline beach at Newport. Less sand is available to beaches downcoast of submarine canyons because the canyons partially intercept the sand being moved along the coast by longshore currents.

The historic Balboa Pavilion, situated at one end of Main Street on the Balboa Peninsula, is a worthy point of interest. Built in 1905 for $15,000, this Victorian landmark was designed to be a "magnificent pleasure pavilion." Through the years, the building has served as a boathouse, a gambling casino and a dancehall of the big band era. A quarter mile west of the Pavilion is a car ferry to Balboa Island. From Balboa, visitors can take cruises to Santa Catalina Island and around Newport Harbor. During the winter gray whale migration, whale-watching cruises also leave from the island.

Upper Newport Bay includes a family recreation area called Newport Dunes. To reach the park take the Bayside East exit from the Coast Highway. Newport Dunes offers swimming in the warm, quiet waters of a lagoon.

Balboa Pavilion street scene in 1911

To the north of the park are the salt marshes of Newport Bay Ecological Reserve, a 741-acre habitat for many marine and tideland species. The reserve is also an important resting place for migratory waterfowl. In winter, as many as 50,000 birds have been counted within the reserve in a single day.

9 Corona del Mar Vista Point and Beach

To reach Corona del Mar from Balboa Island, follow Marine Avenue across the bridge to Bayside Drive. Turn right on Bayside, then stay to the right and follow Fernleaf Avenue uphill. From Fernleaf, turn left on Ocean Boulevard and continue on Ocean until you arrive at a small grassy park on the right. Downcoast from the lookout point are vistas of offshore rocks and open expanses of ocean. Steps lead down from the park to a small, sandy beach and tide pool area.

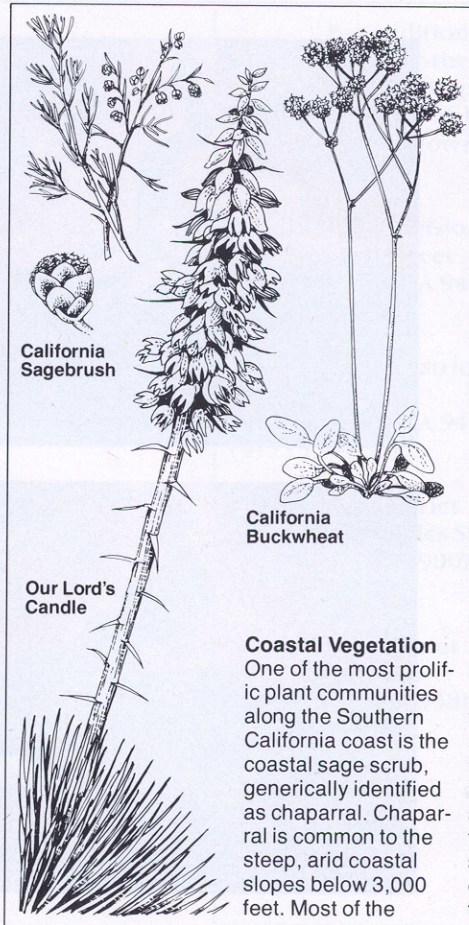
Corona del Mar State Beach is further south on Ocean Boulevard. To reach the parking area and refreshment stands, turn right on Iris Avenue. This beach is noteworthy for its clean, fine sand. Body surfing is also enjoyed here, thanks to the beach's gradually sloping,


Dory fleet at McFadden Wharf in Newport Beach


Balboa Island Ferry


One of Corps-constructed jetties at Newport Harbor


The famous "Wedge" body-surfing area adjacent to Harbor jetty



Coastal Vegetation

One of the most prolific plant communities along the Southern California coast is the coastal sage scrub, generically identified as chaparral. Chaparral is common to the steep, arid coastal slopes below 3,000 feet. Most of the plants in the chaparral family are shrub-like and grow from one to six feet tall. Three of the most common species are California buckwheat, Our Lord's Candle and California sagebrush. For much of the year, California buckwheat sports clusters of white or rose-tinged flowers atop two- to three-foot-high stalks. The plant grows from the San Francisco Bay area to Baja California. Our Lord's Candle has an eight- to fourteen-foot stem that blossoms in late spring with exquisite, white perfumed flowers. The plant is most prevalent from Santa Barbara County and south into Baja. California sagebrush is also common to the headlands from Southern California south. When bruised, this rounded, gray shrub exudes an easily-recognizable tangy aroma.

rock-free bottom which causes the waves to "feather," or spill over, instead of plunging. The reefs beyond the tide pools offer excellent opportunities for snorkeling.

Beginning at Corona del Mar, the topography to the south changes from a lagoon-backed, low-lying shoreline to stalwart bluffs covered with chaparral, a plant community that thrives in arid habitats. The many species of coastal chaparral act as important soil stabilizers.

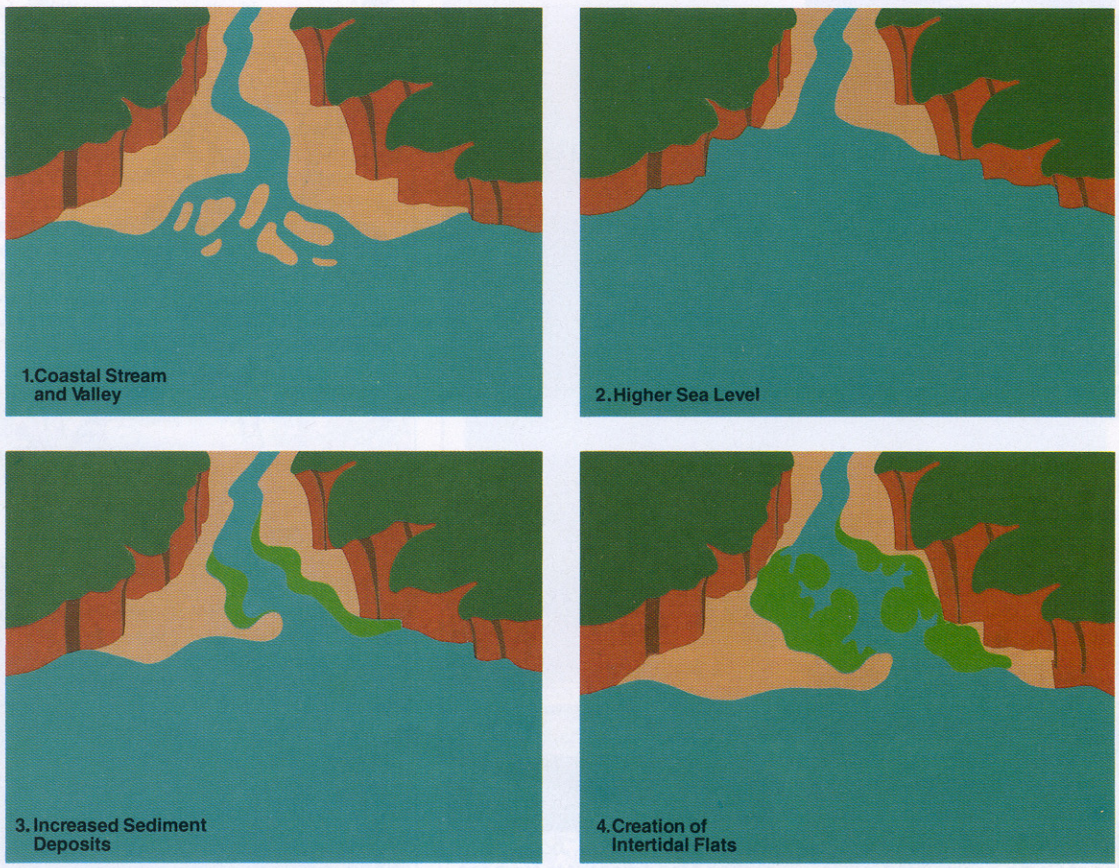
Between Abalone Point and a rocky promontory a short distance downcoast is Emerald Bay, a small pocket beach marked by a seasonal movement of sand from one end of the beach to the other. In summer, when waves are predominantly from the southwest, sand is moved to the north end of the beach. In winter, when waves approach predominantly from the northwest, the sand migrates back toward the south end of the beach.

Much of the coastal area between Corona del Mar and Laguna Beach lies within the 90,000 acre Irvine Ranch. The ranch evolved from the accumulation of Mexican *ranchos* purchased by James Irvine and his partners in the 1870's. The land which lies between Corona del Mar and Laguna Beach and seaward of the Pacific Coast Highway was donated to the State of California by The Irvine Company. Plans are currently being developed to establish this 7,000-acre area as a state park, which will be open to the public. The water area adjacent to this land is a state marine preserve.

View of Newport Harbor entrance and Corona del Mar Beach

Coastal Wetlands

Much of California's shoreline borders the shallow-water marshes and tideflats of coastal lagoons, estuaries and sloughs. Many coastal wetlands are believed to have originated some 15,000 years ago. Many streams then flowed into the ocean far seaward of their present positions and cut large valleys across the present shoreline. Coastal river valleys flooded when sea level rose to the current elevation. River sediments created shallow embayments protected from wave attack by spits and barrier beaches. The reduction in turbulence — combined with the deposition of fine-grained sediments — created intertidal flats ideal for the establishment of salt-marsh plant and animal life.



The Year of the Coast

In keeping with President Carter's declaration of 1980 as "The Year of the Coast," the U.S. Army Corps of Engineers has joined other public agencies and private organizations in focusing attention on the need to manage, preserve and protect our nation's coastal areas. To assist in this worthwhile objective, the U.S. Army Corps of Engineers will, throughout 1980 and 1981, publish a series of brochures highlighting key natural and manmade features of the California Coast. It is hoped that this series will both inform the public of coastal features and processes and assist in the development of a greater appreciation of the critical need to insure the protection and management of coastal resources.

For additional details on these brochures and other public information and education programs available from the Corps of Engineers, please contact the following Public Affairs Offices:

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